

CLAIMS:

1. An analyzer for reading probes comprising:  
a housing;  
a slide carriage mounted for movement within the housing;  
a slide disposed on the slide carriage;  
5 a plurality of probes disposed on the slide in a probe pattern, each probe for generating a probe signal to indicate prior exposure to a predetermined substance or for not generating a probe signal to indicate the absence of prior exposure to the predetermined substance;  
a detector for detecting probe signals from a plurality of probes located in a first pattern  
10 on the slide;  
the probe pattern being denser than the first pattern and being configured in a shape corresponding to the probe pattern so that the detector can sense multiple subsets of the probes within a probe pattern on the slide; and  
a drive mechanism for producing relative movement between the detector and the slide,  
15 the slide and detector moving relatively from a first position, in which the detector reads a first subset of probes within a probe pattern, to a second position in which the detector reads a second subset of probes within the probe pattern.
2. The analyzer of claim 1 further comprising a plurality of sensors arranged on the detector in the first pattern, each sensor being disposed for detecting a probe signal from a single probe when the plurality of sensors are aligned with a subset of the probes on the slide.
3. The analyzer of claim 1 further comprising a plurality of sensors arranged on the detector in the first pattern, the probe pattern containing a plurality of probes  
5 arranged on the slide in subsets of interlaced first patterns so that a single detector may be aligned sequentially with each subset of the probe pattern whereby all of the probes in the probe pattern may be read by aligning the plurality of sensors on the detector with each subset of the probe pattern.

4. The analyzer of claim 1 wherein the first pattern and the probe pattern comprise a plurality of locations are arranged in rows and columns.
5. The analyzer of claim 1 wherein the first pattern and the probe pattern comprise a plurality of locations arranged in a rectangular pattern in rows and columns.
6. The analyzer of claim 1 wherein the first pattern has of the shape of a pie section and the probe pattern is arranged on the slide in a radial orientation.
7. The analyzer of claim 1 wherein the slide is circular, the probe pattern is arranged on the slide in a radial orientation, and the first pattern on the detector is a subset of the probe pattern that may be repetitively aligned with the probe pattern by producing relative rotational movement between the slide and the detector.
8. The analyzer of claim 1 wherein the first pattern comprises a plurality of locations arranged in a truncated pie section, and wherein the probe pattern comprises a plurality of interlaced first patterns arranged radially about center point on the slide so that the slide may be read by placing and aligning the detector over one first pattern on the slide, reading the probes over which the detector is aligned, moving the slide and detector relatively to align the detector with subsequent sets of probes on the slide arranged in the first pattern.
9. The analyzer of claim 1 wherein the first pattern comprises a plurality of locations arranged in rows and columns wherein at least two different rows have different numbers of locations or wherein at least two different columns have a different numbers of locations so that the first pattern is irregular.
10. The analyzer of claim 1 wherein the first pattern comprises a plurality of locations arranged in rows and columns with a different number of locations in each row as compared to the other rows and a different number of locations in each column as compared to the other columns.
11. The analyzer of claim 1 wherein the first pattern comprises K number of locations arranged in X number of columns and Y number of rows, and the probe pattern comprises 4K number of locations arranged in 2X number of columns and 2Y number of rows, the drive mechanism being operable to move the slide relative to the detector so that all locations in the probe pattern are read after the slide is

moved three times relative to the detector and each move is the distance from one location on the probe pattern to an adjacent location on the probe pattern.

12. The analyzer of claim 1 further comprising:

a source of electromagnetic radiation for illuminating the probes at selected times so that the probes are selectively illuminated or not illuminated;  
the probes being constructed to not fluoresce to indicate prior exposure to selected materials and being constructed without any fluorescent material to indicate the absence of prior exposure to selected materials, so that certain probes emit a probe signal in the form of fluorescent light after being illuminated.

13. The analyzer of claim 1 further comprising alignment indicia disposed on the slide for being aligned with the detector to enable the detector to read selected probes.

14. The analyzer of claim 1 further comprising:

the probe pattern including a plurality of subsets, each subset being arranged in a first pattern;

a plurality of sensors arranged on the detector in the first pattern, each sensor being

disposed for detecting a probe signal from a single probe when the plurality of sensors are aligned with a subset of the probes on the slide;

one or more indicia disposed on the slide in the location of one or more probes, the indicia producing a signal in the form of light for being detected by the sensors for aligning the detector such that the sensors are aligned over a subset of probes on the slide that are arranged in the first pattern.

15. The analyzer of claim 1 wherein the drive mechanism comprises an X drive mechanism, a Y drive mechanism and a Z drive mechanism for producing relative motion between the slide and detector in X, Y, and Z directions, respectively, where the X, Y, and Z directions are three non-parallel directions.

16. The analyzer of claim 1 wherein the drive mechanism comprise at least an R drive mechanism for producing relative rotational motion between the slide and the detector about an axis.

17. An analyzer for reading probes comprising:

a housing;

- a slide carriage mounted for movement within the housing;
- a slide disposed on the slide carriage;
- 5 a plurality of probes disposed on the slide in a probe pattern, each probe for generating a probe signal to indicate prior exposure to a predetermined substance or for not generating a probe signal to indicate the absence of prior exposure to the predetermined substance;
- a detector for detecting probe signals from a plurality of probes located in a first pattern
- 10 on the slide and generating detection of signals corresponding to the probe signals;
- the probe pattern being denser than the first pattern and being configured in a shape corresponding to the first pattern so that the detector can sense multiple subsets of the probes within a probe pattern on the slide;
- 15 a drive mechanisms for moving the slide carriage and the slide from a first position, in which the detector reads a first subset of probes within a probe pattern, to a second position in which the detector reads a second a subset of probes within the probe pattern; and
- a data processor connected to the drive mechanism and the detector for receiving the
- 20 detection signals and for issuing command signals for controlling the drive mechanism based in part upon the detection signals.
18. The analyzer of claim 17 wherein said data processor is programmed:
- to issue command signals causing the drive mechanism to move the detector to a first position,
- to receive first detection signals from the detector in the first position and to issue
- 5 command signals based upon the first detection signals causing the drive mechanism to move the detector to a second position.
19. The analyzer of claim 17 further comprising:
- the probe pattern including a plurality of subsets, each subset being arranged in a first pattern;
- a plurality of sensors arranged on the detector in the first pattern, each sensor being
- 5 disposed for detecting a probe signal from a single probe when the plurality of sensors are aligned with a subset of the probes on the slide;

- one or more indicia disposed on the slide in the location of one or more probes, the indicia producing a signal in the form of light for being detected by the sensors; and
- 10 the data processor being programmed to issue a first command causing the detector to move to a first position, to receive first detection signals corresponding to the light produced by the indicia, to issue a second command causing the detector to move to a second position based in part on the first detection signals.
20. The analyzer of claim 17 further comprising:  
the probe pattern including a plurality of subsets, each subset being arranged in a first pattern;  
a plurality of sensors arranged on the detector in the first pattern, each sensor being
- 5 disposed for detecting a probe signal from a single probe when the plurality of sensors are aligned with a subset of the probes on the slide;  
one or more indicia disposed on the slide in the location of one or more probes, the indicia producing a probe signal in the form of light for being detected by the sensors; and
- 10 the data processor being programmed to issue a first command causing the detector to move to a first position, to receive first detection signals corresponding to the light produced by the indicia, to issue a second command causing the detector to move to a second position based in part on the first detection signals, and to repetitively issue commands causing the detector to move to different positions
- 15 based on received detection signals corresponding to the light produced by the indicia until the detection signals indicate that the light received from the first indicia falls within a predetermined intensity range.
21. The analyzer of claim 20 wherein the drive mechanisms is configured to move the slide carriage in X, Y, and Z, directions in response to commands issued by the data processor, where X, Y, and Z are three non-parallel directions.
22. The analyzer of claim 17 further comprising:  
a keypad disposed on the housing and connected to the data processor for producing a key signals in response to input from a user, whereby a user may input commands through the keypad; but

- 5 the data processor being responsive to the key signals to collect data based upon the  
detection signals; and  
a display disposed on the housing and connected to the data processor for displaying  
information to a user, said information corresponding to the commands provided  
by the user through the keypad and including data corresponding to the detection  
10 signals.
23. The analyzer of claim 17 further comprising output means for outputting data  
corresponding to the detection signals.
24. The analyzer of claim 17 further comprising a scanning laser disposed within the  
housing for scanning a laser beam over probe locations on the slide when the slide  
is positioned adjacent the detector, said scanning laser being operable to scan each  
of the probe locations in a first pattern that are being detected by the detector.
25. An analyzer for reading biological probes comprising:  
a housing having a front wall and an opening through the front wall;  
a cassette mounted within the housing for extending at least partially out of the housing  
through the opening in the front wall and for retracting at least partially into the  
5 housing through the opening;  
cassette drive mechanism for moving of the cassette to the first and second positions of  
the cassette;  
a user input for generating user commands in response to a user;  
a display for displaying information to a user;  
10 a slide carriage mounted on the cassette for movement with respect to the cassette;  
a slide disposed on the slide carriage;  
a plurality of probes disposed on the slide in a probe pattern, each probe for generating a  
probe signal to indicate prior exposure to a predetermined substance or for not  
generating a probe signal to indicate the absence of prior exposure to the  
15 predetermined substance;  
a detector for detecting probe signals from a plurality of probes located in a first pattern  
on the slide and producing detection of signals corresponding to the probe signals;  
a plurality of sensors disposed on the detector in the first pattern;

the probe pattern being more dense than the first pattern and being configured in a shape  
20 corresponding to a plurality of first patterns so that the detector can sense multiple  
subsets of the probes within a probe pattern on the slide; and  
carriage drive mechanism for moving the slide carriage and the slide from a first position,  
in which the detector reads a first subset of probes within a probe pattern, to a  
second position in which the detector reads a second subset of probes within the  
25 probe pattern;  
a data processor connected to the display, user input, detector, cassette drive mechanism,  
carriage drive mechanism, and an information output, said data processor for  
receiving a user commands from the user input, for transmitting information to  
the display and displaying information to the user on the display, for transmitting  
30 information causing the cassette drive mechanism to move the cassette between  
the first and second positions of the cassette, for transmitting commands to the  
carriage drive mechanism causing movement of the slide relative to the detector,  
for receiving detection signals and for sending information corresponding to the  
detection signals through the information output.

26. The analyzer of claim 25 further comprising;  
indicia disposed on the slide in a location of a probe for producing alignment signals in  
the form of light that are detected by the detector, the detector producing  
alignment signals as part of the detection signals;  
5 the data processor for receiving the alignment signals as part of the detection signals, for  
issuing a commands to at least the carriage drive mechanism causing the slide to  
move and aligning the sensors on the detector with the probes on the slide based  
upon the alignment signals.